

11.5

Areas of Circles and Sectors

#61

- Goals**
- Find the area of a circle and a sector of a circle.
 - Use areas of circles and sectors to solve problems.

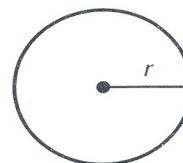
VOCABULARY

Sector of a circle

THEOREM 11.7: AREA OF A CIRCLE

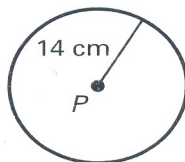
The area of a circle is π times the square of the radius.

$$A = \underline{\hspace{2cm}}$$

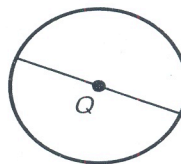


Example 1 Using the Area of a Circle

a. Find the area of $\odot P$.



b. Find the diameter of $\odot Q$.



Area = 125 in.²

Solution

a. Use $r = \underline{\hspace{1cm}}$ in the area formula.

$$\begin{aligned} A &= \pi r^2 \\ &= \pi \cdot \underline{\hspace{1cm}}^2 \\ &= \underline{\hspace{1cm}} \pi \\ &\approx \underline{\hspace{1cm}} \end{aligned}$$

The area is $\underline{\hspace{1cm}} \pi$, or about $\underline{\hspace{1cm}}$, square centimeters.

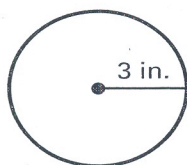
b. The diameter is $\underline{\hspace{1cm}}$ the radius.

$$\begin{aligned} A &= \pi r^2 \\ \underline{\hspace{1cm}} &= \pi r^2 \\ \frac{\underline{\hspace{1cm}}}{\pi} &= r^2 \\ \underline{\hspace{1cm}} &\approx r^2 \\ \underline{\hspace{1cm}} &\approx r \end{aligned}$$

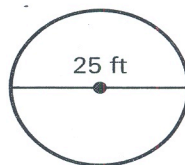
The diameter is about $\underline{\hspace{1cm}}$ ($\underline{\hspace{1cm}}$), or $\underline{\hspace{1cm}}$, inches.

✓ **Checkpoint** Find the indicated measure.

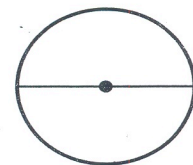
1. Area



2. Area



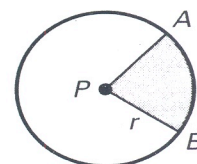
3. Diameter



Area = 248 mm^2

THEOREM 11.8: AREA OF A SECTOR

The ratio of the area A of a sector of a circle to the area of the circle is equal to the ratio of the measure of the intercepted arc to 360° .



$$\frac{A}{\boxed{}} = \frac{\boxed{}}{360^\circ}, \text{ or } A = \frac{\boxed{}}{360^\circ} \cdot \underline{\hspace{2cm}}$$

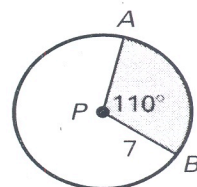
Example 2 Finding the Area of a Sector

Find the area of the sector.

Solution

Sector APB intercepts an arc whose measure is $\underline{\hspace{2cm}}$.

The radius is $\underline{\hspace{2cm}}$ units.



$$A = \frac{\boxed{}}{360^\circ} \cdot \underline{\hspace{2cm}}$$

Formula for area of a sector

$$= \frac{\boxed{}}{360^\circ} \cdot \pi(\underline{\hspace{2cm}})^2$$

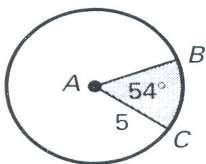
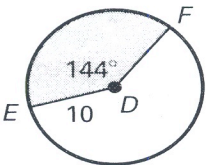
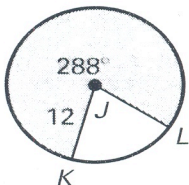
Substitute known values.

$$\approx \underline{\hspace{2cm}}$$

Use a calculator.

Answer The area of the sector is about $\underline{\hspace{2cm}}$ square units.

✓ **Checkpoint** Find the area of the shaded region.

<p>4.</p> 	<p>5.</p> 	<p>6.</p> 
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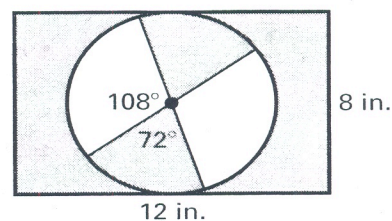
Example 3 *Finding the Area of a Region*

Find the area of the shaded region.

Solution

The shaded region consists of a rectangle and two sectors of a circle.

The rectangle has a length of inches and a width of inches. The radius of the circle is inches.



Area	=	Area of rectangle	- 2 ·	Area of one unshaded sector
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$$= \underline{\hspace{1cm}} \cdot \underline{\hspace{1cm}} - 2 \cdot \frac{\underline{\hspace{1cm}}}{360^\circ} \cdot \pi \cdot \underline{\hspace{1cm}}^2$$

$$= \underline{\hspace{1cm}} - 2 \left(\frac{\underline{\hspace{1cm}}}{10} \cdot \pi \cdot \underline{\hspace{1cm}} \right)$$

$$= \underline{\hspace{1cm}} - \frac{\underline{\hspace{1cm}}}{5} \pi$$

$$\approx \underline{\hspace{1cm}}$$

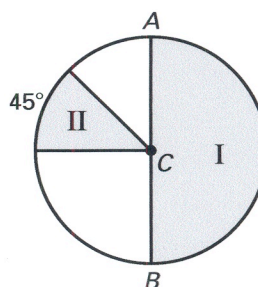
Answer The area of the shaded region is about square inches.

Practice A

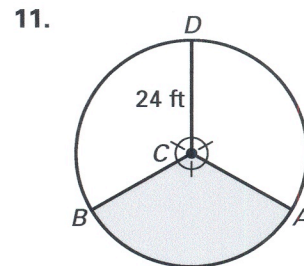
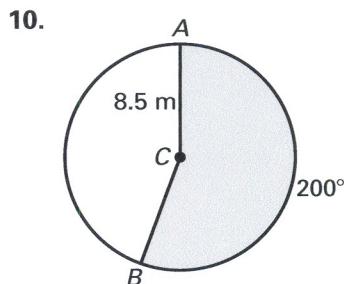
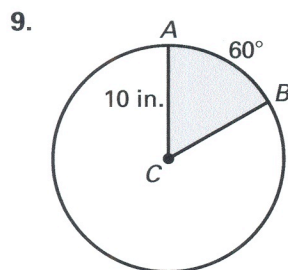
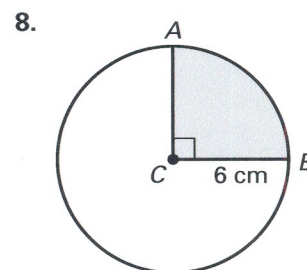
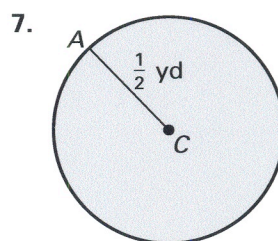
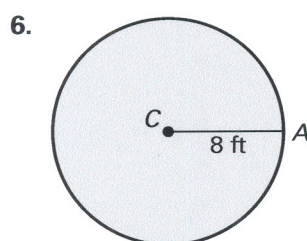
For use with pages 691–698

Match the measure with its value.

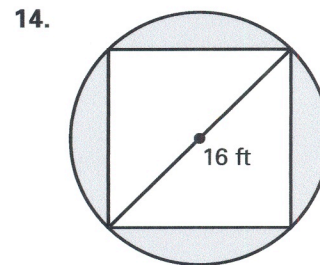
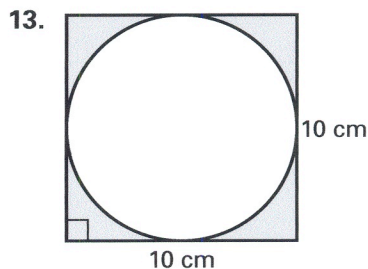
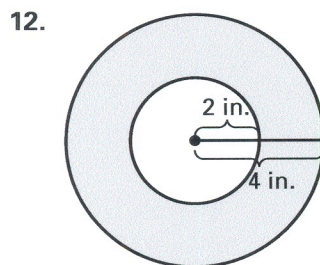
- | | |
|-----------------------------|--------------------------------|
| 1. $m\widehat{AB}$ | A. $2\pi \text{ units}^2$ |
| 2. Area $\odot C$ | B. $16\pi \text{ units}^2$ |
| 3. Area of shaded region I | C. $6\pi \text{ units}^2$ |
| 4. Area of shaded region II | D. $180^\circ \text{ units}^2$ |
| 5. Area of unshaded region | E. $8\pi \text{ units}^2$ |



Find the area of the shaded region.



Find the area of the shaded region.



Determine the radius of the circle with the given area.

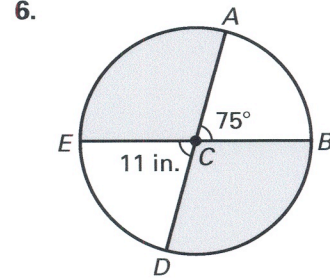
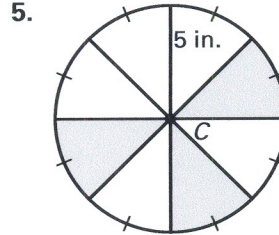
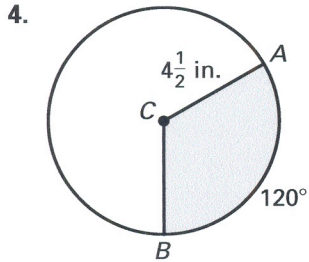
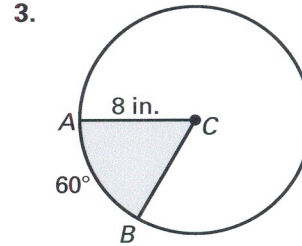
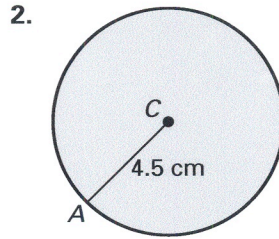
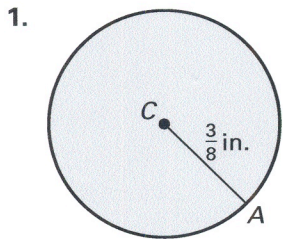
15. $A = 25\pi \text{ cm}^2$

16. $A = 144\pi \text{ in.}^2$

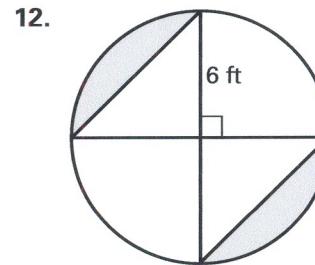
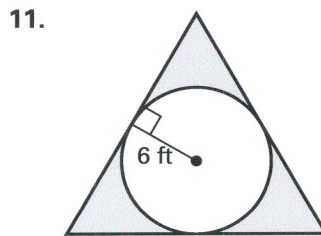
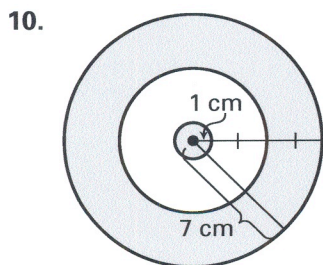
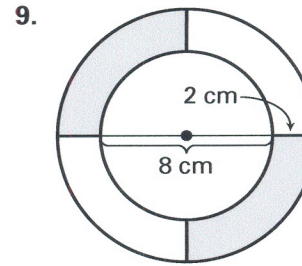
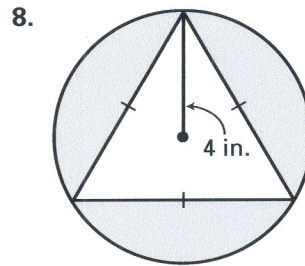
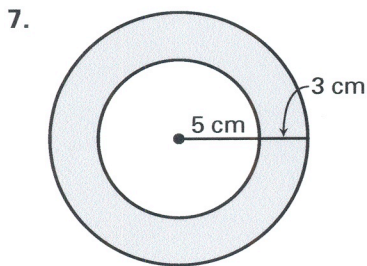
17. $A = 48 \text{ ft}^2$

LESSON

Find the area of the shaded region.



Find the area of the shaded region.



Consider an arc of a circle with radius 4 inches. Copy and complete the table. Use $\pi \approx 3.14$ and round answers to the nearest tenth.

13.

Measure of arc	30°	60°	90°	120°	150°	180°
Area of corresponding sector						

Study Guide

1.7

Area of a Circle

The area A of a circle equals π times the radius r squared: $A = \pi r^2$.

Examples 1 Find the area of the circle.

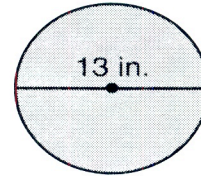
$$A = \pi r^2$$

$$A = \pi \left(\frac{13}{2} \right)^2$$

$$A = \pi(42.25)$$

$$A \approx 132.73$$

The area of the circle is about 132.7 in^2 .



2 Find the area of the shaded region.

Assume that the smaller circles are congruent.

Find the area of
the large circle.

Find the area of
a small circle.

$$A = \pi r^2$$

$$A = \pi(20)^2$$

$$A \approx 1256.64$$

$$A = \pi r^2$$

$$A = \pi(6)^2$$

$$A \approx 113.10$$

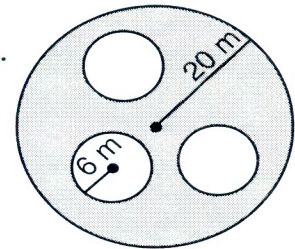
Now find the area of the shaded region.

$$A \approx 1256.64 - 3(113.10)$$

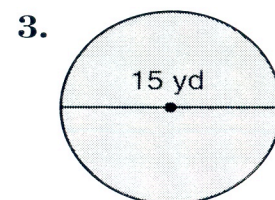
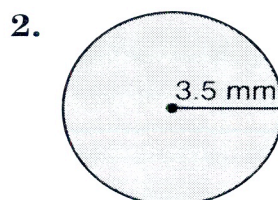
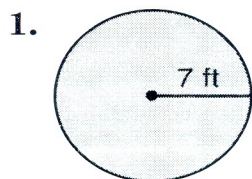
$$\approx 1256.64 - 339.3$$

$$\approx 917.34$$

The area of the shaded region is about 917.3 m^2 .



Find the area of each circle to the nearest tenth.



Find the area of each shaded region to the nearest tenth.

